Compressed Air

DEVOTED TO THE USEFUL APPLICATION OF COMPRESSED AIR

VOL. II. NEW YORK, DECEMBER, 1897. No. 10

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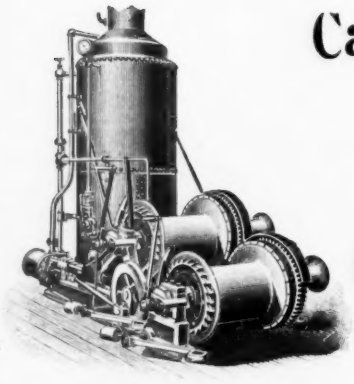

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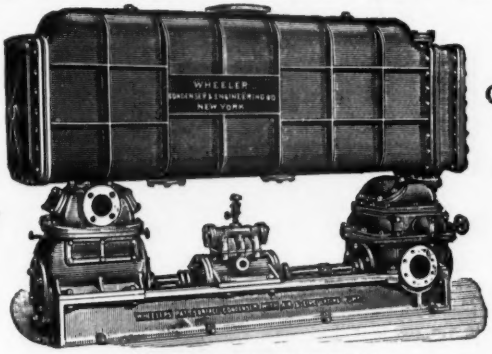

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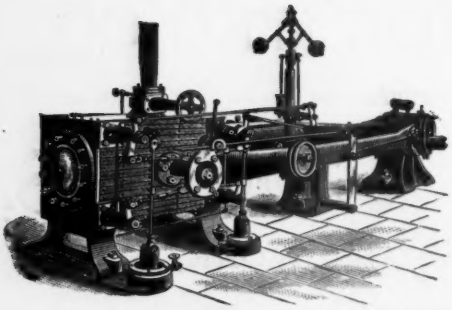

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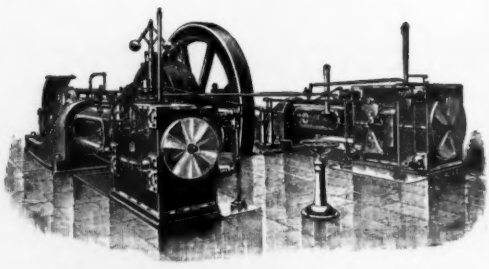

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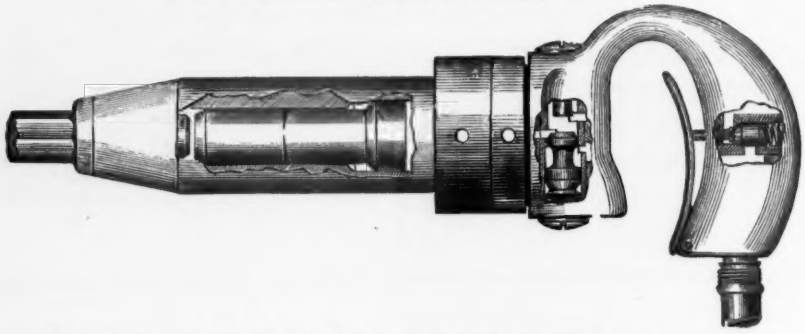

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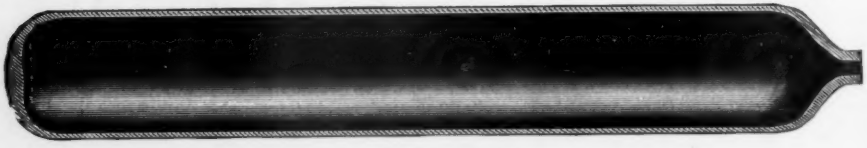

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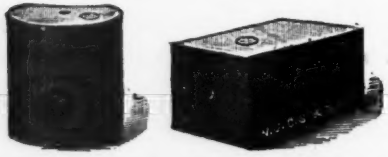

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Subscription, including postage, United States, Canada and Mexico $1.00 a year. All other countries, $1.50 a year. Single copies, 10 cents.

Advertising rates furnished on application.

We invite correspondence from engineers, contractors, inventors and others interested in compressed air.

All communications should be addressed to COMPRESSED AIR, 26 Cortlandt St., New York.

London Office, 92 & 93 Fleet Street.

Those who fail to receive papers promptly will please notify us at once.

Entered as Second-Class Matter at the New York, N. Y., Post Office.

VOL. II. DECEMBER, 1897. NO. 10.

This is the tenth number of Volume II. of COMPRESSED AIR, the paper being now nearly two years of age. We do not claim to have prospered much, but we think we have learned a good deal, and among other things it is clear that this paper is an established and permanent success. We have resisted efforts to induce us to enlarge the publication, because we believe that every new thing should creep before it walks, and we are convinced that the useful application of compressed air has not gone far enough to warrant anything more voluminous in the way of a publication. We have furthermore resisted the tendency of the age, which is to print too much; to publish pictures and reading matter to such an extent as to make it practically impossible for the diligent and thorough reader to treat each subject with sufficient thought to fix it in his memory. We read newspapers nowadays through head-lines, and there are so many technical publications and so much printed matter that the student who seeks to be informed really only gets a superficial knowledge of things.

The application of compressed air to useful work is growing steadily day by day, and this paper proposes to follow this growth. We have no doubt that in time the applications will be so wide and diversified, so full of new ideas, new inventions and new thoughts, that we will be warranted in increasing these pages, even to a large volume. We have endeavored to publish and illustrate practical applications in the art, and have from time to time given new and useful formulas, tables, and theoretical deductions. That the paper is of value as a reference is shown on every hand. Our correspondence and our growing circulation give us substantial proof of the truth of this. The demand for the paper, particularly for back numbers, has been so great as to entirely exhaust our supply, notwithstanding the fact that we have printed from one to eight thousand copies each month since the first issue.

Our aim is to do justice to this useful and important science, and to publish only such things as are absolutely accurate. In no sense is COMPRESSED AIR a trade publication. It is not devoted to the development and sale of air compressors, or of any other compressed air devices. It is devoted to the development of a useful science—compressed air. We have favored no manufacturer, but have done what was best and most consistent to forward the interests of all advertisers. The advertising columns of this paper are open to any individual or company having a high standing and sufficient credit. Our advertising patronage has grown steadily, because it is recognized that where one paper has the field to itself its value to advertisers in that line is materially higher than where there are a large number of publications all treating of the same subject.

We feel safe in saying that this little paper is read each month from beginning to end. Readers are not exhausted by so much reading matter that they have no time to look at the ads.; and furthermore, the advertising pages are valuable, in that the whole paper is a compendium of compressed air information and apparatus. If one seeks to know where any compressed air device which has been applied practically may be found, he has only to look into these pages to find out the name and address of the manufacturers. Makers of compressed air apparatus have a well-defined field which really does not warrant them in doing general advertising, and for this reason a publication like this, which goes directly into that field, is of substantial value.

Cold Storage and Cold Rooms from Compressed Air.

BY G. D. HISCOX, M.E.

In view of the largely increasing demand for the means of preserving food in the warmer sections of the United States, and in tropical climates, where ice cannot be obtained, or the cost is so great as to preclude its use, the use of compressed air as a constant cooling medium is one of the means at the command and control of every one who is able to place a small outlay for a valuable boon to household comfort; and for the profit that may be realized from the power to preserve fruit, vegetables and meat for sale, or for the time and opportunity for shipment to a market.

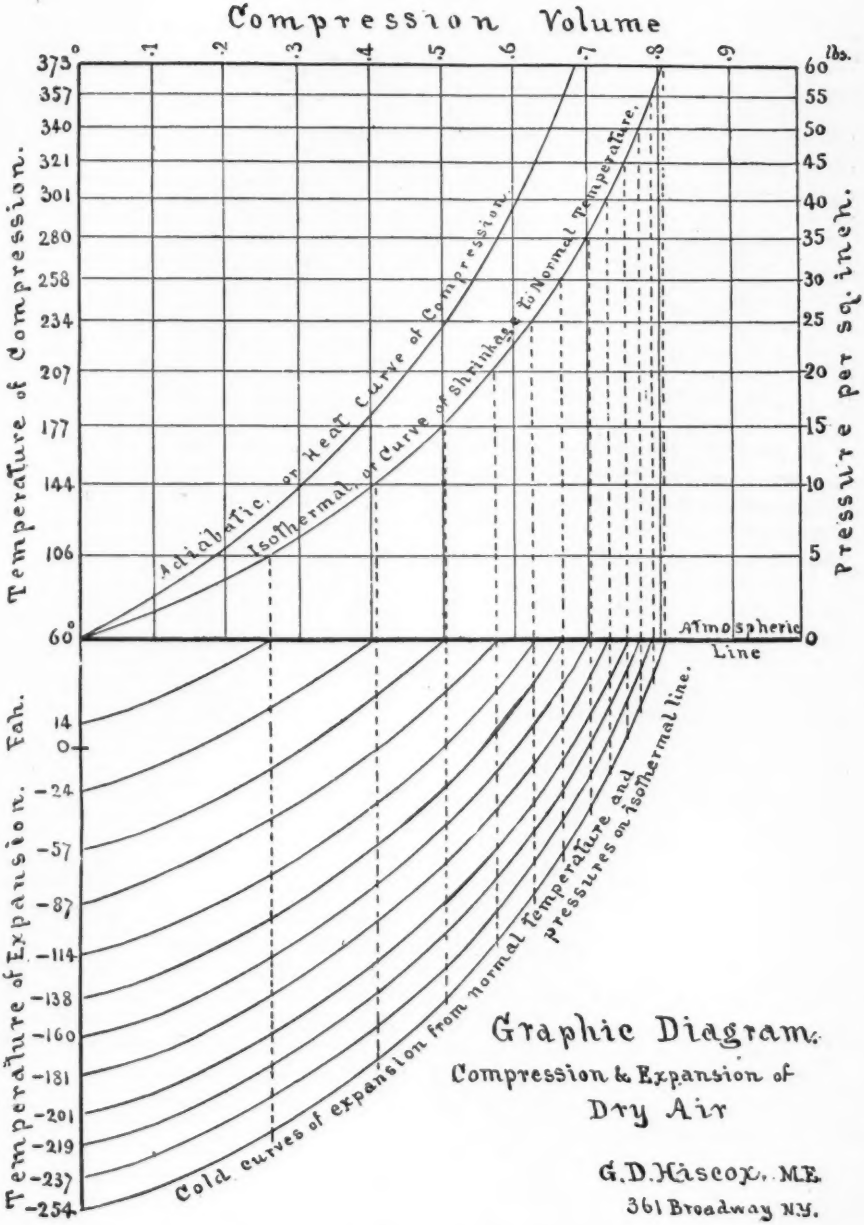
There are large tracts of country in the Southern section of the United States in which are situated plantations and farms, the owners and managers of which, having the financial means to supply comforts to life by the use of cold preserved food, who are entirely beyond the reach of ice, either natural or artificial, and to whom such wants may be supplied by the means of any small power such as a windmill, a waterfall or a gasoline engine, operating a pump for the compression of air. In Mexico, the Central American and South American states, the field for useful work by wind and water power alone for contributing to domestic comfort by the preservation of food is immense; where power from nature as through a windmill or waterwheel can be utilized. The distance need not be considered beyond the cost of a small pipe for conveying the compressed air, as a considerable length is needed to cool the air to its normal temperature which has been heated by the operation of compression; when by expansion to atmospheric pressure the same amount of heat may be eliminated from the expanding air as was accumulated by its compression, and from which a large cooling efficiency may be obtained.

The graphic diagram has been made to show at sight the cooling effect produced by the free expansion of dry air from various pressures and from the normal temperature of 60 degrees Fahrenheit. The conditions of air expansion for any natural temperature of the stored air may be found by simply adding the difference to the expansion column when normally above 60 degrees, or subtracting when below 60 degrees. Thus, in an atmospheric temperature of 80 degrees, the cold produced by expanding from 20 pounds pressure would be minus 67 degrees instead of minus 87, as shown in the diagram. From 50 pounds pressure and 90 deg. atmospheric temperature, the cold air of expansion would be minus 108 deg instead of minus 138, as in the diagram; thus for any atmospheric condition of temperature and pressure, the theoretical condition of cold by expansion may be known by simple inspection of their several relations as shown in the diagram.

The diagram shows much that is interesting in regard to the general conditions and effect of air compression and expansion. It will be seen that the column of pressures on the right corresponds with the column of heat developed by compression on the left, while the upper or adiabatic curve shows the condition of temperature, pressure and volume at the moment of compression. The lower or isothermal line shows the shrinkage of the volume due to the cooling of air to its normal temperature.

The vertical dotted lines from the intersection of the isothermal line with the horizontal lines of pressure, meeting the atmospheric line, from the starting points for the curves of expansion extended on the same scale of temperature corresponding with the scale of compression.

The intersection of the dotted lines extended through the curved lines of expansion show also in a graphic way the fractional expansions from one stage of com-



Graphic Diagram.

Compression & Expansion of Dry Air

G. D. Hiscox, M.E.
361 Broadway N.Y.

pression to another lower one as measured by the expansion scale at the left hand side. Thus a volume of air at 60 pound pressure and 60° temperature, when expanded to 30 pound pressure, its temperature will fall to the intersection of the extended dotted line of 30° with the 60 pound curve, which measured on the expansion scale is —57°, and so on for any other pressures.

In applying the conditions of air expansion to the practical effects of refrigeration or the cooling of rooms for cold storage and preservation of food, a large departure from the theoretical figures for the degree of cold by air expansion must be made on the favorable side for success.

The absorption of heat from the walls of a cold room, the cooling of a large body of air in the room and of food products stored and the greater loss from frequent opening of a cold room for the removal and refilling, with the natural leakage of cold air around the doors, makes the margin of loss in cold air production a larger one than at first appears when brought into actual use.

The amount of specific heat contained in a given volume of air is about 1–800 of the amount contained in the same volume of water for any number of degrees change of temperature at ordinary climatic temperatures, so that there is a large margin between the volume of cold air required to cool a room filled with air only and the volume required to cool a room filled with fruit, vegetables, milk, butter or meat containing from 50 to 90 per cent. of water and of which the solid parts also have a far higher specific heat than air.

This property of water-loaded food accounts for the time required to cool a loaded cold storage room over the time required for cooling an empty one, as well as the necessity for so packing the material of storage that the cold air can circulate freely and bring every part to the required temperature in the shortest possible time.

As to the work that compressed air will do in cooling rooms, there is a large marginal range in the quantity of free air required for a specific temperature, due to the conditions of temperature of the material to be cooled and the amount of compression in the air to be expanded for this duty.

Assuming, for example, a cold room for a farm or plantation of 1,000 cu. ft. capacity, or say 12 ft. square by 7 ft. high, thoroughly insulated, with a double door at side for storing; a single or trap door with a small ventilator at top, with steps from the trap door for every-day use, and also lighted from the top. By this means a loss of cold air is prevented by its greater specific gravity holding it at the bottom. The room may be kept uniformly at 34° Fah. in an outside temperature averaging 80°. To cool such a room from 80° to 34° requires a loss of 46° in a volume of 1,000 cu. ft. of air, say 77 pounds, the specific heat of which is 0·2377 water = 1. Then $77 \times 0{\cdot}2377 = 18{\cdot}3$ heat units must be absorbed for every degree of change in temperature. Then $18{\cdot}3 \times 46° = 841$ heat units must be abstracted to bring it to 34° Fah., leaving out the cooling of the walls, which will be only a matter of time in the initial operation.

Assuming to use an air pressure of only 30 pound per sq. inch, then in the graphic diagram, tracing the dotted line from the isothermal curve junction of 30 pound and following its curve of expansion, we have —138 x 60° to the atmospheric line = 198° difference in temperature by expansion from 30 pound pressure, or 198 heat units per pound of air. Then $\frac{841}{198} = 4{\cdot}24$ lb. or 55½ cu. ft. of free air at 30 lb. pressure will be required to cool the room to 34°.

A compressor of 5 cu. ft. per minute capacity, using less than one horse power will furnish enough air to reduce the temperature of the room from 80° to 34° in

about 15 minutes, and should then easily furnish cold air for absorption of heat from the material of storage and to supply the waste made necessary by ventilation and radiation with a constant work of less than a half horse power. This power comes within the scope of a cheap class of water wheels, water motors, and the smaller sizes of gasoline engines and windmills.

Where intermittent power must be used, as with windmills and power engines, a system of storage of compressed air may be used with perfect satisfaction as affording a constant flow of air into the cold room and also into a small refrigerator, which will be found a most useful adjunct for kitchen use and the cooling of drinking water.

The amount of pipe surface required for cooling compressed air to the normal temperature is a matter of much importance, as its delivery at the point of expansion, to be effective, must be at, or very near, the temperature of the outside atmosphere.

The method of keeping the air-cooling pipe at the proper temperature fixes the amount of pipe surface to be provided.

For 30 pound pressure, 15 sq. ft. of cooling surface per cu. ft. of free air used per minute is a fair proportion for an air-cooling coil exposed to a free circulation of the atmosphere and shaded from the sun's heat.

This would indicate a coil of 150 feet of 1½-inch pipe for the requirement of a cold room as above stated, which may also include the leading pipe from compressor to cold room, if favorably situated for cooling. Where it is convenient to use water for cooling, either by a sprinkler or by submerging the coil in a tank of water fed from a stream or by pumping, the size of the coil may be greatly reduced, according to the temperature of the water.

For an intermittent power as a windmill, or a gasoline engine that would not be convenient to run at night, a storage of air will be necessary by the use of a proportionally increased power during the day for accumulating compressed air in tanks.

The storage of sufficient air for a ten hours' run of the above plant will require tanks to hold about 1200 cu. ft., or say 3 tanks of cylindrical form 5 feet diameter, 21 feet long. As the atmospheric temperature always falls at night in tropical and semi-tropical regions, the conditions of compressed air supply may be much modified in the storage quantity above outlined, and where constant power can be obtained, the whole question of cold storage for private use becomes a cheap and simple one.

The arrangement of the nozzle or orifice for delivering the compressed air, and at which point the expansion takes place, is important and requires its area to be exactly gauged to the proper size for the delivery of the desired volume of air at the assigned pressure. At 30 pounds pressure, air flows through an orifice in a thin plate at the rate of 525 feet per second. Then for the plant as above described, for the issuance of 5 cu. ft. of free air per minute under a compression of 3 volumes in 1, is $\frac{5}{3 \times 60} = 0.02777$ cu. ft. of compressed air per second, and $\frac{0.02777}{525} = 0.0000529$ of a square foot area. Then $0.0000529 \times 144 = 0.0076176$ of a square inch. Then enlarging for the coefficient of efflux, the orifice should be ⅛ inch diameter, with a valve back of it to shut off the air flow when required. Means should also be provided for blowing off any water that may condense in the air pipes or storage tanks by the cooling of the air after compression.

With proper care and a moderate outlay the system of cold storage by compressed air becomes a simple, efficient and economical adjunct to the living comforts of every home in a warm climate not blessed with a nearby ice-making plant.

A Model Compressed Air Foundry Plant.

The value of compressed air for operating small motors on isolated and moving apparatus, especially when power is used for perhaps a minute or so in every ten, is beginning to be appreciated in this country as it should be, and hardly a week passes that does not record some valuable addition to the list of new applications of this nature.

This progress would be much faster but for the fact that usually a change to air power involves a considerable outlay for new machinery and the discarding of the old type, which may be in good or perfect condition.

A neat avoidance of this objection is shown in Fig. 1, which illustrates a foundry crane in the works of John J. Radley & Co., structural iron manufacturers, New York city. This was originally made to be operated by hand, but to it has been attached an air motor without changing the original gearing in the least, so it may at any time be operated either by hand or air.

The motor is reversible and of the direct-acting piston type. Its economy in the use of air is best illustrated by stating that the air compressor is stopped at the end of the day's work, with the air receiver (which is in this case a large boiler) fully charged, and sufficient air is thus stored to draw all their castings in the evening without running the compressor.

These progressive Founders are, we believe, the first to successfully apply this

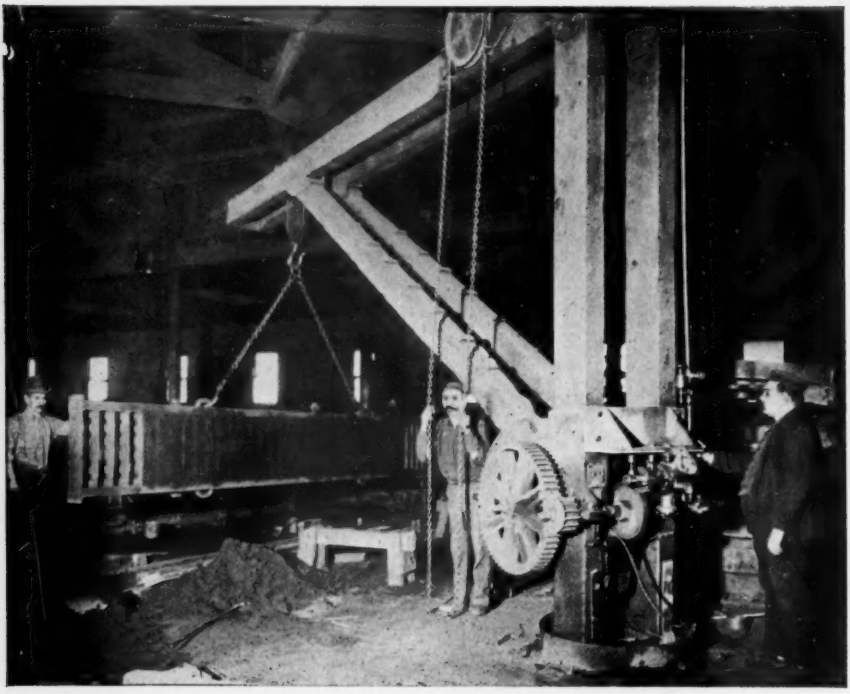


FIG. 1.—COMPRESSED AIR MOTOR ATTACHED TO FOUNDRY CRANE.

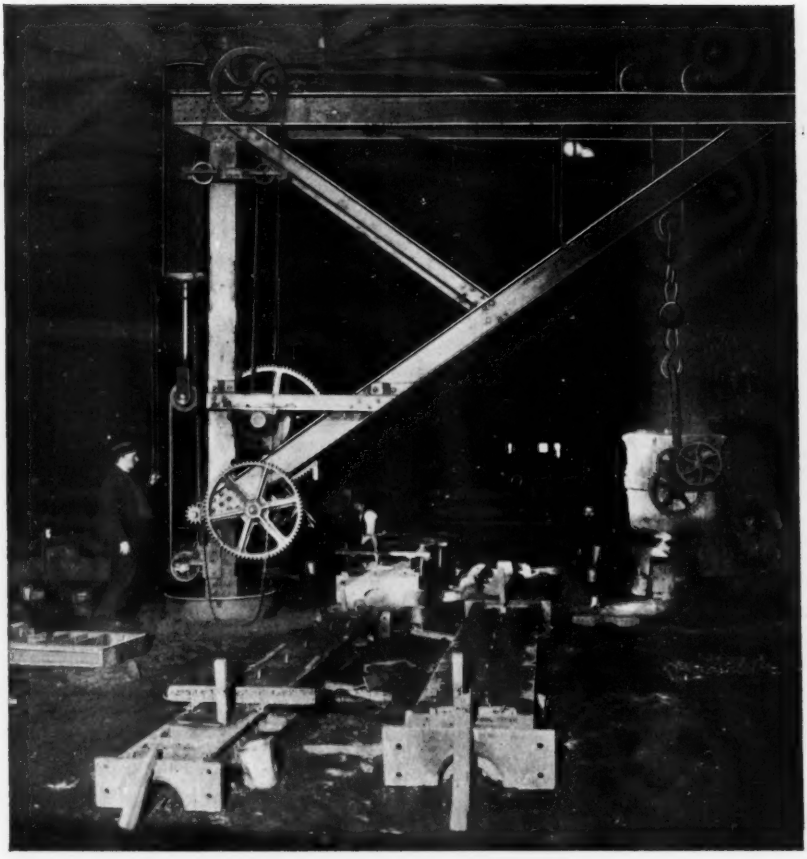


FIG. 2.—CYLINDER HOIST ON FOUNDRY CRANE.

method to every-day shop practice; and the fact that they have proven this possible should effectively remove the objection that has sometimes been raised, that it is "so hard to keep air from leaking away." If they do not use any air in the evening, they find nearly the same pressure on the gauge in the morning as when the compressor was stopped, which shows that joints can be made tight and that compressed air is favorable to keeping them so.

This little motor, which weighs less than 200 pounds, easily lifts 8,000 pounds ten feet per minute, and by changes in the gearing can be made to lift almost any load. In use it is protected by a sheet-iron case to keep out dust.

These motors are used on traveling cranes for lifting the load and for moving the traveler along the track, and are well adapted to any light derrick work. For many purposes they are preferable to straight lift hoists, because they are not limited in the height of lift; use air only in proportion to distance load is lifted; hold load in constant position; do not jump up

when part of load is removed, as in pouring molten metals; will do delicate mould work safely, and can be placed in close quarters where a cylinder hoist could not be used at all. For operating any light machine where it is inconvenient to get a belt, they should be very useful.

Fig. 2 shows another air crane in this same foundry, which embodies some original ideas of the owners, the chief one being the method of connecting the ropes; one end of the hoisting ropes is connected to a Whiting Foundry and Equipment Co.'s Cylinder Hoist, carried out to the lifting sheave and back to a hand windlass on the mast. This windlass works on one end of the rope, or the air cylinder on the other end; so this, too, is either a hand or air crane at will. The ladle suspended on this crane is also of the improved Whiting make.

These people also use a Haeseler Portable Compressed Air Breast Drill for boring test holes in cast iron columns.

Ample power for all these appliances is furnished by 10-inch belt-driven air compressor, which when air is not being used, automatically unloads itself, taking power only in proportion to the work being done in the foundry.

This entire compressed air equipment was furnished by the Ingersoll-Sergeant Drill Co., Havemeyer Building, New York city. H. M. PERRY.

Regulating Temperature of Buildings by Compressed Air.

We are enabled to present a plan showing in detail the system employed by the Davis & Roesch Co., of New York, for the regulation of temperature in buildings of all kinds. To control the temperature of rooms it is necessary to regulate the heat, and, wherever convenient, to also regulate the ventilation. The above system provides fully for both, and the results have proved to be very satisfactory. An installation similar to the one shown in the drawing has lately been made in the residence of Mayor Charles J. Fisk, of Plainfield, N. J. The temperature of the rooms is kept at the desired degree by the operation of thermostats, distributed throughout the house, and compressed air is conducted through 1-16 inch tubes to the thermostats and to the flues which admit the hot air, completing a circuit that automatically opens and shuts the dampers in the flues and also the drafts of the furnace.

The heating of the house mentioned is by the indirect hot water system, but any system of heating may be controlled in a similar manner.

By referring to the drawing Fig. 1, it will be seen that the cold air enters at "A" and passes to the chamber "B," where the radiators are located, and the air is there heated and continues on to the rooms.

The thermostats are placed in the rooms to be controlled, and connection is made between them and the dampers in the flues by the compressed air tubes.

With the temperature at 50 degrees and the heat just beginning to radiate, the indicator of the thermostat is placed at the degree on the thermometer at which the temperature is desired. The temperature desired in the illustration is 70 deg. F. The heat coming into the room acts upon the thermostat, and when the temperature reaches 70 degrees the compressed air is turned on by the thermostat; the diaphragm attachments controlling the dampers are fitted, and the heat is shut off. The moment the temperature falls below 70 degrees the compressed air is released and the dampers are opened. In this way a steady temperature is maintained, the system working constantly with variations within one degree of temperature.

A small hydraulic air compressor, of novel design and automatically regulated,

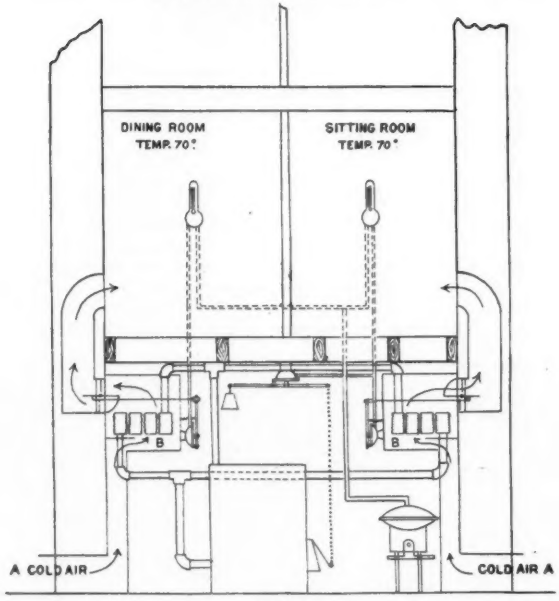


FIG. I.

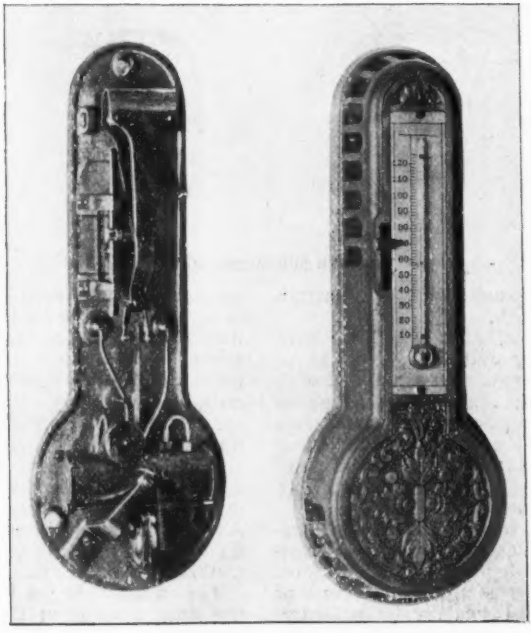


FIG. 2.—THERMOSTAT.

is placed in the cellar; this supplies the air receiver, maintaining a constant air pressure of about ten pounds, although only about five pounds pressure is required to operate the system.

Fig. 2 shows the internal mechanism of the thermostat. It is operated by the direct action of compressed air, and although appearing of complex construction is in reality very simple of action and requires but little care. It is easy to adjust and controls the slightest variation in temperature. The action of the instrument is produced by the expansion or contraction of scientifically combined metals so sensitive as to respond even to the warmth of the human breath.

In another installation which we have seen, the window and hall transoms of an office building are also connected with the system. The operation is as above described, opening the transoms and closing the valves of the steam radiators when the temperature has risen to the desired point, and closing the transoms and turning on the steam as soon as it begins to fall.

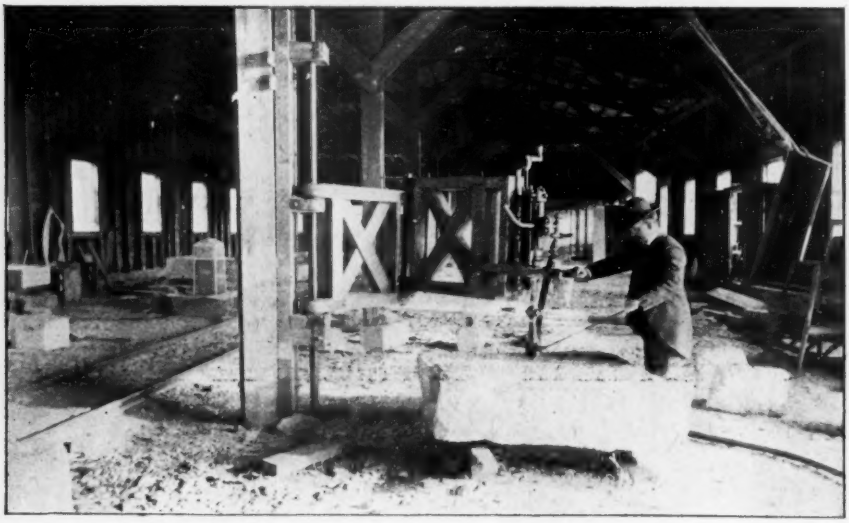
The system can be applied to any number of rooms, and each room may be regulated at different degrees of temperature.

The device insures the maintenance of a comfortable and healthy temperature, and at the same time, by directly controlling the generation of the supply of heat, produces economy in the use of fuel, using it only as the requirements of the various rooms indicated by their several thermostats demand.

Granite Surfacing Machine.

The picture shows a granite surfacer which is being adopted in quarries and by bridge builders and for general construction where compressed air is used. It will be seen that an ordinary 2¾" rock drill is mounted on a swinging frame. It is operated by one man, who begins his work on the undressed block of granite at the highest parts of the uneven surface. The stroke is regulated by the feed screw as in ordinary drilling, and as the surfacer is being swung around over its work it may be regulated by the throttle so as to avoid striking low places, thus evening up the surface as desired. The machine shown is now used by the Pochuck Granite Co., B. J. Mallon, superintendent, Goshen, N. Y., and has made an excellent record. One machine will surface as much as ten men. A test showed that in 25 minutes it would do as much surfacing as a good stonecutter could do in ten hours.

The exhaust air can be used for keeping the dust away from the work, and this makes it much pleasanter for the operator.



GRANITE SURFACING MACHINE.

Surfacing Railroad Track by means of Compressed Air.

We present two views of the method of surfacing railroad track by means of compressed air; one, a shop view of the mechanism in its present development, the other, a view taken while in operation in broken stone, in maintenance, the most difficult and expensive of all ballast.

The theory underlying the method pursued since the birth of the railroad has been, that material be driven by blows under the ties to resist the vertical gravity of trains, but in practice no two men thus tamp equally, the train develops the weak or unequal points, and each recurrent tamping to correct the inequalities largely destroys the work previously done.

In the compressed air method, the theory and practice is reversed

The inevitable train gravity is availed of and relied upon to consolidate the foundation to its full possibility, and the cavities beneath the ties disclosed by raising the track to the desired surface are then filled from the ends of the ties with suitable material conveyed by the air blast without other disturbance of the compacted roadbed.

In renewing ties (50,000,000 per year are required in this country alone), the same theory is followed.

MACHINE FOR SURFACING RAILROAD TRACK BY MEANS OF COMPRESSED AIR.

The spikes of the new tie are not driven home, but the tie is held up to the rail and thoroughly filled with suitable material from its open side, the ballast other than at the ends is then replaced and dressed, and the tie gets its first tamping by train gravity, "shimming" it if necessary until the bed has reached its greatest compactness, and then home spiking it and filling the vacant space as before described.

The method finds immediate favor with

SURFACING RAILROAD TRACK BY MEANS OF COMPRESSED AIR.

trackmen, as, while each man is obliged to steadily perform his part in the operation, lest the work of all stop, the manual exertion required of each is very much less than in the old method.

The material found in use to be the most satisfactory is clean gravel, furnace slag and stone screenings reduced to a size not too large to enter the cavities under the ties.

The advocates of the process claim for it:

The advantage of using under the tie, a material suitable as to size and substance, without regard to the oft-times inferior quality of the ballast in the roadbed.

Evenness of its work.

Readiness of its operation in slight elevations, down to ¼ inch.

Greater accomplishment per linear foot of track, per man per hour.

Greater serviceability of the tie in coarse ballasts, owing to limited area of bearing points, and to base destruction by present tamping practice.

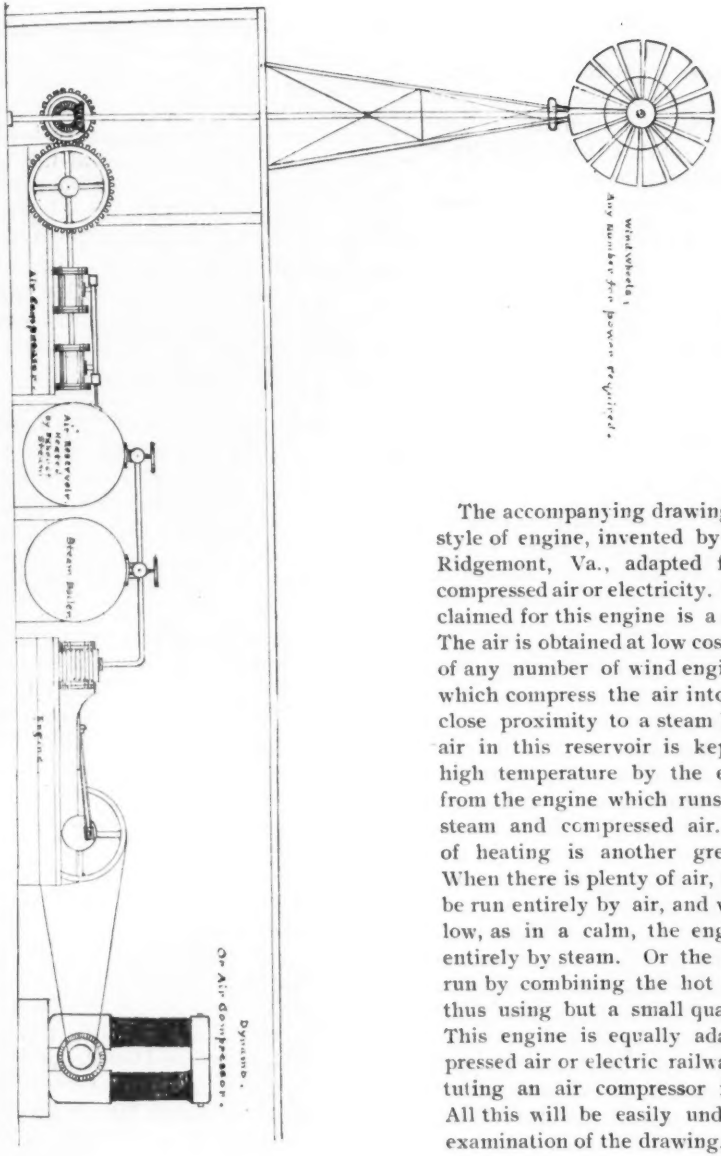
Practicability for use in metal tie track, hitherto not surfaceable.

The conserving of the time and labor previously bestowed upon the work.

Air Motor for Copenhagen.

By the steamship "Hekla," of the Thingvalla Line, which has just cleared for Copenhagen, a full set of street-car equipment, consisting of compressor, storage tanks, valves, motor, etc., was shipped to a syndicate formed in Denmark for the introduction of air motors in Scandinavian countries, regarding which the following translation from a Copenhagen newspaper is interesting to American readers, who have not yet had the pleasure of seeing air adopted by any American street railroad, although it is understood that a number of contracts are being held open, pending the consolidation of the air companies:

"Mr. Josephsen, as president of the Danish Air Power Co., has been working with the Copenhagen authorities to bring about the use of air motors in the streets of Copenhagen for street car service, and to this end the Danish syndicate has arranged with the American Air Power Co., of New York city, for a full equipment, which is expected to arrive about Christmas time, and in the meantime the company is acquiring the rights for the most desirable streets in Copenhagen."



The accompanying drawing shows a new style of engine, invented by W. A. Vallo, Ridgemont, Va., adapted for generating compressed air or electricity. The advantage claimed for this engine is a saving in fuel. The air is obtained at low cost by the action of any number of wind engines or wheels, which compress the air into a reservoir in close proximity to a steam boiler, and the air in this reservoir is kept heated to a high temperature by the exhaust steam from the engine which runs alternately by steam and compressed air. This manner of heating is another great advantage. When there is plenty of air, the engine can be run entirely by air, and when the air is low, as in a calm, the engine can be run entirely by steam. Or the engine can be run by combining the hot air and steam, thus using but a small quantity of steam. This engine is equally adapted for compressed air or electric railways, by substituting an air compressor for a dynamo. All this will be easily understood by an examination of the drawing.

JETS OF AIR.

"Pure Air in a Telephone Building in Cleveland, Ohio," is the title of an article in the "Engineering Record." It seems that dust has a very injurious effect upon certain devices in connection with switchboards, and to obviate this difficulty a small air pump with pressure tank is located in the basement, by which fresh pure air is delivered to the Exchange room.

The Exchange is on the top floor. The air is drawn into a duct in the basement through a screen and passed through heating coils of 1-inch pipe. A spray chamber is placed through the upper part of the air passage. Small holes in this chamber allow water to issue and take up all the dust that may come in with the air. The compressed air fan driven by a steam engine forces the cleansed and heated air through a 24" x 36" flue to the Exchange. In the summer time the air will be allowed to cool before it goes to the Exchange.

After cleaning the iron work of the New York Viaduct at 155th street, as described and illustrated in October number of COMPRESSED AIR, the engineers in charge conducted a test of painting the cleaned surfaces by a compressed air painting machine. It is necessary to paint the cleaned spaces very quickly on account of the rapidity with which the fresh surfaces oxidize. The Bryce Pneumatic Paint Machine was given a trial in which it was demonstrated that in 20 minutes it could cover 285 square feet, while it would require between three and four hours for one man to cover the same space by hand. The control of the machine was so good that the paint was distributed in the interior parts difficult to reach by hand, equally as well as the exposed surfaces. The overhead plates were painted without any dropping of the paint. One overhead opening between adjacent plates was about half an inch wide and extended upward about two inches. This had to be painted formerly by means of a swab, but the interior surfaces were coated by the air-blast without any trouble by moving the nozzle in front of the opening and about two feet from it. The construction of the paint distributor is very simple. The air and paint are conducted through separate passages to the base of the nozzle. The air passage ends in a small injector nozzle, adjustable longitudinally, which atomizes and sprays the paint into the main fan-shaped nozzle, and is discharged to the surfaces to be painted; the operator at all times being able to regulate the quantity of paint discharged.

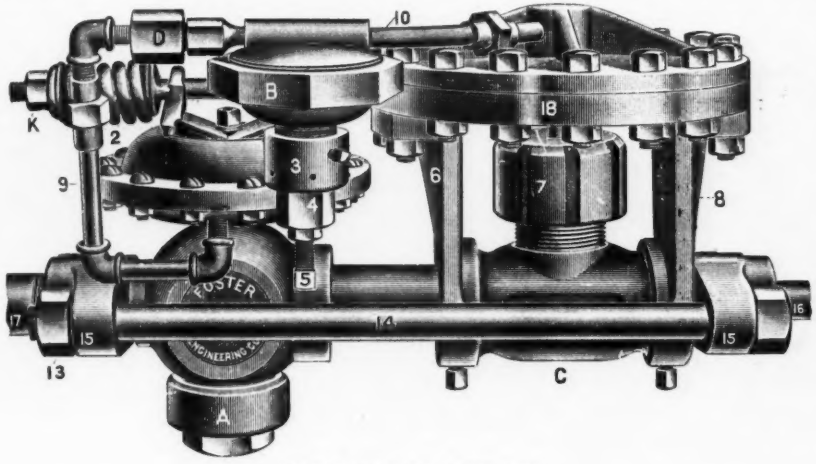
An inquiry comes to us asking for the services of some compressed air genius who can devise a practical compressed air apparatus for ringing chime bells. A short time ago 18 stationary chime bells, the heaviest of which is about 6 000 pounds, and the lightest about 300 pounds, were placed in St. Patrick's Cathedral, New York. It was intended to ring them by electricity, but thus far no device has been acceptable. It has been suggested that by a suitable installation compressed air would do the work satisfactorily. The church authorities will lend any assistance to enable experiments to be carried on, providing the plan submitted appears feasible.

The employment of compressed air in finishing silk ribbon is a branch of compressed air application which has received little or no attention from compressed air authorities, but nevertheless air has been used quite extensively for this purpose and has proven of considerable value to the ribbon manufacturers. Compressed air is superior to steam for spraying the finishing material upon the ribbon, because its exhaust into the atmosphere is not offensive to the operator; it does not

scatter the particles of finishing material, but concentrates the entire force of the spray upon the ribbon. Ribbons finished with the compressed air spray possess a better lustre than those finished by the steam spray, because the steam condensation dilutes and weakens the finishing material. The air is heated before it reaches the spraying nozzles, in order to produce the desired effect.

The Foster Regulator.

The frequent inquiries we have for pressure regulators have led us to show the illustration herewith, which is a view of the Foster combined pressure regulator and automatic stop valve for high initial air pressure. This valve has been used successfully in various experimental works and in connection with some very important ones where high pressures were employed.



FOSTER PRESSURE REGULATOR.

Probably the most difficult problem to solve in connection with the use of high initial air pressures up to 3,000 lbs., in order to make it commercially successful, is the automatic regulation of the air so as to maintain a constant uniform delivery pressure against a variable initial pressure, which may be at any point between 150 and 3,000 lbs. on the square inch.

The operation of a reducing valve is controlled by the delivery pressure acting on a diaphragm or its equivalent, against a spring or its equivalent. It will, therefore, be readily understood that with an initial pressure of 2,000 or 3,000 lbs. the valve may not have to open more than one or two thousandths of an inch in order to give the necessary delivery.

A is the regulating valve, B an auxiliary valve, and C the stop valve. Air is admitted through pipe 16, and passing through the stop valve enters the regulating valve (which latter is constructed on principles similar to the regular Class W), and is delivered at pipe 17. The delivery pressure entering the diaphragm chamber of the regulating valve, passes through pipe 9 and strainer D to the auxiliary valve, which is controlled by a diaphragm operating against the spring contained in the casing 4, the pressure of the spring being regulated by screw 5. If, for instance, the regulator is set to deliver 100 lbs., and the discharge pressure should be shut off, the tendency would be to increase the discharge pressure in pipe 17, if there should be any leak through the regulator valve. This pressure acting on the diaphragm in auxiliary valve B, will, when it reaches say 120 lbs., open the valve and allow the air to pass through pipe 10 to a diaphragm chamber, 18 in stop valve C. The area of this diaphragm in stop valve C is sufficient to give about 12,000 lbs. pressure, which, operating on a steel beveled plunger, forces it into its seat with power enough to make a crushed joint on the valve seat, thus effectually closing off the flow of air. When this delivery pressure falls to its normal condition, say 100 lbs., the spring in

casing 4 opens the auxiliary valve and allows the air in the diaphragm chamber of the stop valve to exhaust through the small ports 3 into the air. The initial pressure then acting upon the steel plunger forces the stop valve open.

In a recent test of this valve where there was frequent stopping and starting of an air motor, it was found that the stop valve automatically closed off the air at every stop of the motor, and immediately opened when the motor was started.

The device is self-contained, as shown in the engraving - the connections between the stop and regulating valves being made up with crushed joints, held in place by two rods, 14, clamping the two end pieces, 15 together.

COMMUNICATIONS.

Under this heading will be published inquiries addressed to the Editor of COMPRESSED AIR. We wish to encourage our readers in the practice of making inquiries and expressing opinions.

We request that the rules governing such correspondence will be observed, viz: all communications should be written on one side of the paper only: they should be short and to the point.

VIENNA, November 7th, 1897.

Editor "Compressed Air"

DEAR SIR: The other day I happened to see a number of your valuable paper, and upon the first perusal I found that it really meets a long felt want both on my part as well as many other mechanical engineers in this country. I had at once sent you a subscription by my firm (White, Child & Benez, Vienna), and I am sure that several others of my friends in the trade will do so too.

Yours very respectfully,

(Signed) EMIL MARITSCHEK, M. E.,
Vienna (Austria)
II Tacorstrasse 22
2.2.27

PNEUMATIC APPLIANCES.

PATENTS GRANTED NOVEMBER, 1897.

Specially prepared for COMPRESSED AIR from the Patent Office files by Grafton L. McGill.

593,049.—Apparatus for Compressing Air. E. Hill, South Norwalk, Conn.

A series of connected charging stands are used in conjunction with the apparatus for charging a tank with compressed air from a suitable compressor. One of the charging stands contains two independent valved passage-ways, one of which has a check-valve, and the other two manual-valves, between which the check-valve is interposed. The charging stands are adapted to have locomotives connected therewith, while on each of the stands is an air reservoir in which the compressed air accumulates when the same is not taken by the locomotive.

593,013.—Pneumatic Painting Apparatus. Abel Fisher, Wellsville, Ohio.

This device consists of a sprayer operated by manual power. It comprises a casing having an air-nozzle in one end, formed with converging walls which project some distance beyond the paint nozzle. The air and paint are held in the same tank, so that by means of spring-controlled valves the paint is forced with great velocity through the nozzle. The tank is normally charged at about sixty pounds to the square inch. One end of the sprayer is formed with a pistol-grip, that it may be conveniently held in the hand, while the air-supply source is carried on a movable stand.

593,431.—Pneumatic Water-Raising Device. Edmund Pitcher, et al., Sunapee, N. H.

A frame is provided with a tank having a vertical movement in the former, said tank being provided with a water-inlet and a water-discharge. An air-supply pipe connects the tank with a source of compressed air, while within this pipe is a valve having an arm engaging at its free end a loop at the top of the tank, whereby said valve is automatically shifted by the movement of the tank, to connect the pipe with the tank in order that compressed air may be admitted to the latter, or to connect the tank with the outer air and thus discharge the air from the tank. Weighted levers are arranged to engage the top of the tank for temporarily locking it in the lowermost position, while similarly weighted levers engage the bottom of the tank and hold it in the uppermost position.

593,655.—Pneumatic Motor. F. W. Hedgeland, Chicago, Ill.

An exhaust chamber is common to all of a series of pneumatics, around which former the latter are arranged. A pulley, driven by the pneumatics, is supported upon an axis parallel with the axes of the pneumatics. On the side face of this pulley is a single cam which actuates a series of valves, the stems of which are parallel with the axes of, and control, the pneumatics.

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26 Cortlandt St., New York.

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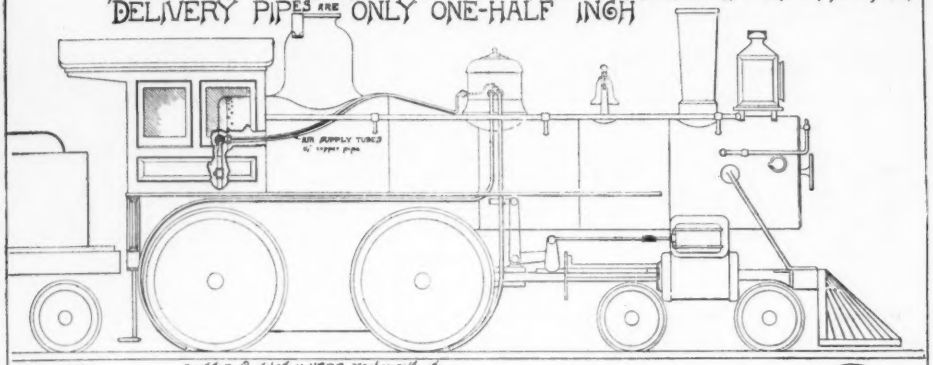

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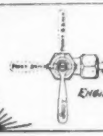
AND NO POWER LOST IN PULLING TRAIN OVER SUPERFLUOUS SAND.



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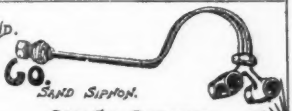

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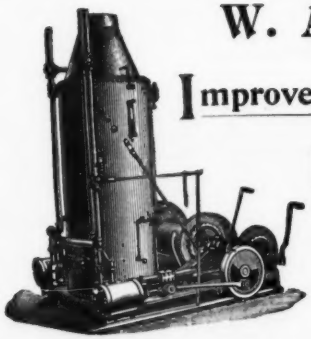

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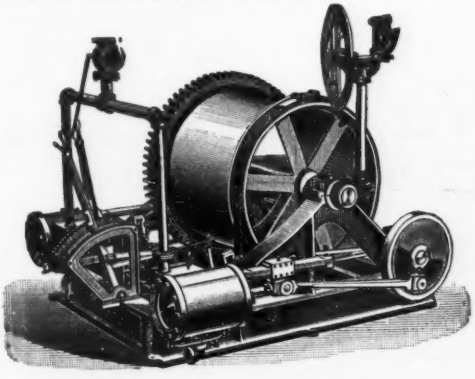

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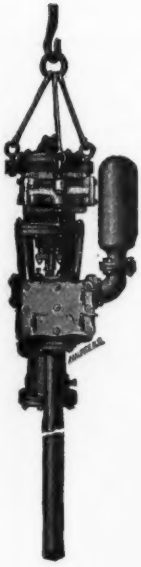

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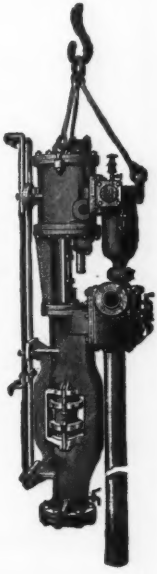

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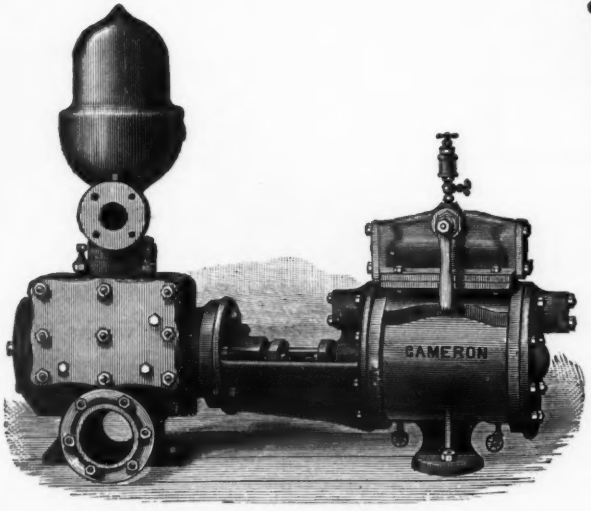

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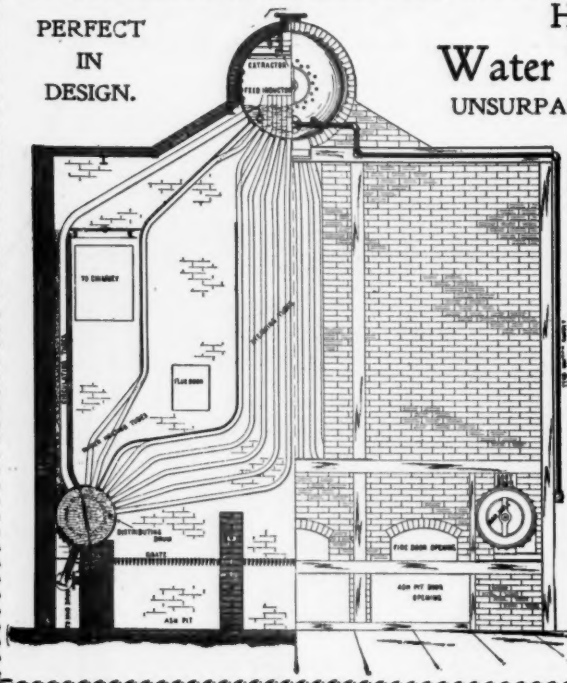

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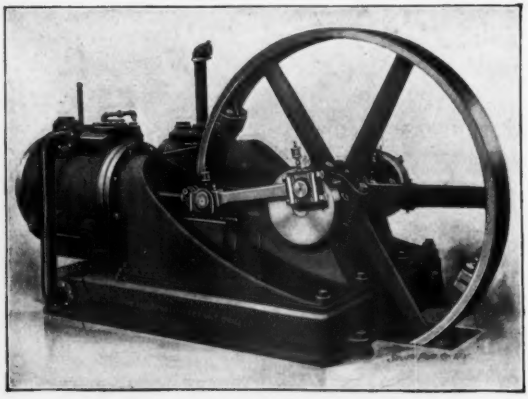

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